

## SECTION 05511

### SHOP-FABRICATED METAL STAIRS AND RAILINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. **This Section includes** prefabricated steel stair assemblies, factory-primed, with jobsite poured-in-place concrete treads, landings, and platforms, complete with welded handrails and guardrails. Quality of workmanship required for each fabrication shall be Class 1 (architectural metals) NAAMM AMP 555-92.
  - 1. Concrete shall have non-slip aggregate finish.
- B. **Related Sections include:**
  - 1. Division 3 Section "Concrete, Formwork, and Reinforcing Steel" for concrete fill in stair treads and landings.
  - 2. Division 5 Section "Structural Steel" for structural steel framing system components.
  - 3. Division 9 Section "Gypsum Board Assemblies."
  - 4. Division 9 Section "Gypsum Board Shaftwall."
  - 5. Division 9 Section "Painting" for paint finish.

##### 1.2 REFERENCES

- A. **Industry Standards:** The industry standards listed below refer to the latest date of issue or edition, unless otherwise indicated in this Section.
  - 1. ADA - Americans with Disabilities Act of 1990, Accessibility Guidelines for Buildings and Facilities.
  - 2. ANSI A117.1 - American National Standard for Buildings and Facilities: Providing accessibility and usability for physically handicapped people.
  - 3. AWS A2.0 - Standard Welding Symbols.
  - 4. AWS D1.1 - Structural Welding Code.
  - 5. SSPC - Steel Structures Painting Council.
  - 6. AISC - American Institute of Steel Construction.
  - 7. AISI - American Iron and Steel Institute - Cold Form Steel Design Manual.
  - 8. ASTM A 36 - Structural Steel.
  - 9. ASTM A 500 or 513 - Steel Tubing.
  - 10. ASTM A 307 - Bolts and Nuts.
  - 11. ASTM A 569 - Steel Sheets.
  - 12. Federal Specification TT-P-636 - Shop-Applied Prime Paint.
  - 13. ASTM A 325 - High Strength Bolts for Structural Steel Joints.
  - 14. ASTM A 386 - Zinc Coating (Hot-Dip) on Assembled Steel Products.
  - 15. SSPC - Steel Structures Painting Council.

##### 1.3 SYSTEM DESCRIPTION

- A. **Stair System:** Stairs shall be a prefabricated steel stair system complete with factory-assembled stair units, factory-fabricated stair risers, job-poured concrete

filled treads and landings, horizontal header and landing channels including vertical supports (steel angle struts, hanger rods and connectors, columns, or welded embedment plates), factory-assembled stair railing for side-mounted installation to wall and/or top-mount installation on channel stringers and plate stringers as indicated. Wall-mounted railings include brackets, bolts, and all fasteners for a complete and proper installation.

1. Stair system shall include all steel necessary for a complete and proper installation.

- B. Railings:** Provide stringer, landing, and platform-mounted railings with welded-wire mesh infill as indicated on Drawings, including brackets, bolts, and all fasteners for a complete and proper installation. Wall-mounted railings shall include brackets and bolts.

#### 1.4 STRUCTURAL REQUIREMENTS

- A. Railing assembly** shall comply with ADA Article 4.26.3 "Structural Strength."
- B. Handrails and Guardrails:** Fabricate and install to withstand the following loads:
1. Concentrated load of 200 pounds applied at any point, non-concurrently, vertically or horizontally, at the top rail.
  2. Concentrated load of 200 pounds applied horizontally over any 1 foot square area of intermediate rails or in-fill.
  3. At top rail, a uniform load of 50 plf applied horizontally at top rail, and a simultaneous load of 100 plf applied vertically.
  4. Concentrated and uniform loads above need not be assumed to act concurrently.
- C. Minimum Live Load:** Fabricate metal stair assembly to support a minimum uniform live load of 100 psf of projected plan area.

#### 1.5 SUBMITTALS

- A. Shop Drawings:** Indicate profiles of metal sections, sizes, reinforcing, thickness, anchorage, connection attachments, size and type of fasteners, accessories, and all required field measurements.
1. For installed metal stairs, handrails, railings, and embedded plates in cast-in-place concrete indicated to comply with design loads, include structural analysis data signed and sealed by the structural engineer responsible for their preparation licensed in the state of Louisiana.
  2. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
  3. Show work to be built-in or provided by other trades.
  4. Indicate method of securing stair assembly to building structure.
- B. Certificates:** Furnish manufacturer's certification that materials meet specification requirements.
- C. Samples:** Submit samples of materials or products as requested by Architect.
- D. Welder Certificates:** Submit certification specified under "Quality Assurance" Article.

## 1.6 QUALITY ASSURANCE

- A. Workmanship:** Quality of workmanship required for each fabrication shall be Class 1 (architectural metals), NAAMM AMP 555-92, as follows:
1. Class 1 (Architectural Metals):
    - a. Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show when painted or polished.
    - b. Welds shall be concealed where possible. Exposed welds are ground to small radius with uniform sized cover unless otherwise noted.
      - 1) Welds shall be Ornamental Quality as defined by the National Ornamental & Miscellaneous Metals Association (NOMMA).
    - c. Distortions shall not be visible to the eye.
    - d. Exposed joints are fitted to a hairline finish.
- B. Professional Structural Engineer Qualifications:** A professional structural engineer who is legally qualified to practice in the State of Louisiana and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of metal stairs, handrails and railings that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer Qualifications:** Submit evidence of having not less than 10 years successful production of this product. Manufacturer shall be approved by the American Institute of Steel Construction Certification Program.
- D. Tolerances:** Coordinate fabrication and installation with adjacent building structure and systems and verify all governing or related dimensions to insure an accurate, precise installation.
- E. Regulatory Requirements:** All components shall meet or exceed OSHA, ADA, and appropriate building code requirements.
- F. Welding Work:** All welding work shall be performed by certified welders.
1. Welders: Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and is currently certified.
- G. Samples:** Submit representative Samples of balustrade and post materials with finish.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products** in exact accordance with the manufacturer's latest published requirements and specifications. Deliver stair-anchoring devices, which are to be placed in concrete in sufficient time to avoid delay to that work.
1. Provide instructions for proper installation of these items.
- B. Storage on Site:** Store material in a location and in a manner to avoid damage. Stack in a manner that prevents bending and damaging of products.

## 1.8 SEQUENCING/SCHEDULING

- A. Coordinate Shop Drawings, fabrication, delivery, and installation.**

## 1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Approved Manufacturers:** Subject to compliance with requirements of this Section, provide products of one of the following:
1. Sharon Stair Ltd.
  2. American Stair Co.
  3. Alfab, Inc.
  4. Approved equal.

### 2.2 MATERIALS

- A. **General:** Fabricate stairs and landings with closed risers and treads.
- B. **Structure:**
1. Sections, Plates, Sheet and Bars: ASTM A 36, structural quality steel.
    - a. Stringer: Minimum 7 gage, ¼ inch and larger, ASTM A 36.
  2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, or hot-formed tubing, ASTM A 501 if required by structural loads.
    - a. Size: As indicated on Drawings.
  3. Pipe columns: Minimum 2-inch-diameter, Schedule 40. Provide pipe or square tubing.
  4. Threaded and Hanger Rods: Minimum ¾-inch-diameter, ASTM A 36.
  5. Fittings: Elbows, tee-shapes, wall brackets, escutcheons, of machined steel.
  6. Bolts, Nuts, and Washers: ASTM A 325.
  7. Welding Materials: AWS D1.1; type required for materials being welded.
    - a. Wire: E-70-S, AWS A5.18.
  8. Risers: Formed sheet steel risers, minimum 14 gage; ASTM A 569.
  9. Treads: Minimum 14 gage sheet steel pan for concrete fill; ASTM A 569. Reinforce underside with angles to attain design load requirements.
  10. Balustrade Mesh: 8 gage woven wire mesh, 2-by-2-inch intermediate crimp with channel frame.
- C. **Landings:**
1. Steel Landing: Field-poured concrete landings.
- D. **Railings and Panels:** 1-1/2-inch-o.d. by 13 gage high strength tubing, ASTM A500 B.
1. 3 rail system (guard, hand and bottom rail) with full panel welded wire mesh; 8 gage, 2-by-2-inch square pattern.

### 2.3 PAINT

- A. **Repair Paint:** Touch up field welds by application of same material used for shop primer paint.

## 2.4 CONCRETE FILL AND REINFORCING MATERIALS

- A. **Concrete Materials and Properties:** Comply with requirements of Division 3 Section "Concrete, Formwork and Reinforcing Steel" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 3,000 psi, and a W/C ratio of 0.55 maximum, unless otherwise indicated.
- B. **Non-Slip Aggregate Finish:** Factory-graded, packaged aluminum oxide grits or crushed emery; rustproof and non-glazing; unaffected by freezing, moisture or cleaning materials.
- C. **Reinforcing Bars:** ASTM A 615, Grade 60, unless otherwise indicated.

## 2.5 FABRICATION-GENERAL

- A. **Quality of workmanship** for each fabrication shall be Class 1 (architectural metals), NAAMM AMP 555-92 as defined under "Quality Assurance" Article.
  - 1. Class 1 (Architectural Metals).
    - a. Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show when painted or polished.
    - b. Welds shall be concealed where possible. Exposed welds are ground to small radius with uniform sized cover unless otherwise noted.
      - 1) Welds shall be Ornamental Quality as defined by the National Ornamental & Miscellaneous Metals Association (NOMMA)
    - c. Distortions shall not be visible to the eye.
    - d. Exposed joints are fitted to a hairline finish.
- B. **General:** Fabricate stair assemblies to support a minimum live load of 100 lbs. per sq. ft. with stringer deflection not to exceed 1/180 of span. Fabricate in accordance with approved Shop Drawings.
  - 1. Stairs shall be of welded steel construction.
  - 2. Verify dimensions on site prior to shop fabrication when job conditions permit.
  - 3. Provide closures for ends of stringers.
  - 4. Fit and shop assemble in largest practical sections, for delivery to site.
  - 5. Fabricate components with joints tightly fitted and secured.
  - 6. Continuously seal jointed pieces by continuous welds.
  - 7. Sections shall be marked for re-assembly and coordinated installations.
- C. **Welded Connections:** Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. **Mechanical Connections:** Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- E. **Handrail/Guardrail Assemblies:** Railings and guardrails shall comply with ADA Article 4.26.3 and all applicable codes. Furnish complete with connectors to stringers and structure.
  1. Fabricate in accordance with approved Shop Drawings.
  2. Close open ends of railings with steel plates welded in place and ground smooth.
  3. Form simple and compound curves by bending pipes or shapes in jigs to produce uniform curves. Maintain profile throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces.
- F. **Grind exposed joints flush and smooth with adjacent finish surface.** Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- G. **Exposed Mechanical Fastenings:** Flush countersunk screws or bolts; unobtrusively located, consistent with design of component, except where specifically noted otherwise.
- H. **Anchorage:** Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- I. **Accurately form components** required for anchorage of stairs, landings, and railings to each other and to building structure.
- J. **Railings:** Fabricate to profiles shown on Drawings. Where not specifically detailed, manufacturer's standard railings may be used upon Architect's approval.
  1. Use concealed fasteners wherever possible.
  2. For exposed fasteners, use countersunk flat-head type.

## 2.6 FINISHES

- A. **General:** Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to application and designations of finishes. Finish items after fabrication.
- B. **Shop priming** shall be in compliance with quality requirements of Structural Steel Painting Council (SSPC).
  1. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. **Primer:** One shop coat of hi-solids red oxide anti-corrosive primer qualitatively meeting performance requirements of Federal Specifications TT-P-664, TT-P-636 and SSPC 1364.

- D. **Do not prime** surfaces in direct contact with concrete or where field welding is required.
- E. **Paint Finish:** As specified in Division 9 Section "Painting."

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. **Field Conditions:** Verify that field conditions are acceptable and are ready to receive work.
- B. **Existing Conditions:** Beginning of installation means erector accepts existing conditions.

#### **3.2 PREPARATION**

- A. **Clean and strip** primed steel items to bare metal where site welding is required.
- B. **Cast-In Items:** Supply items required to be cast into concrete with setting templates, to appropriate sections.

#### **3.3 INSTALLATION**

- A. **Cast-In-Place Concrete Treads:** Field-install concrete treads in accordance with Division 3 Section "Concrete, Formwork and Reinforcing Steel." Coordinate installation of abrasive stair tread nosings.
- B. **Install items plumb and level,** accurately fitted, free from distortion or defects and in accordance with approved Shop Drawings.
- C. **Connections:** Provide anchors, plates, angles and struts required for connecting stairs to structure.
- D. **Erection and Installation:** Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- E. **Field weld** components indicated on Drawings. Perform field welding in accordance with AWS D1.1.
- F. **Field bolt and weld** to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- G. **Joints:** Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.
- H. **Site Cutting:** Obtain Architect's approval prior to site cutting or making adjustments not scheduled.
- I. **Field Priming:** After erection, prime welds, abrasions, and surfaces not shop primed except surfaces to be in contact with concrete.

- J. All field connections shall comply with Class 1 (architectural metals) NAAMM AMP 555-92 for quality of workmanship.

### 3.4 CLEANING AND TOUCH-UP

- A. **Cleaning:** Clean the stairs and railing assembly thoroughly.
- B. **Touch-up** damaged shop coat with primer matching the shop coat.
- C. **Remove debris,** containers, and excess material resulting from work specified herein.

END OF SECTION